

## CLAIMS

1. A coaxial microwave plasma torch, comprising:
  - a cylindrical outside conductor;
  - a cylindrical electric discharge tube, fixedly inserted into an axial hole formed in said outside conductor on one end face side; and
  - a coaxial cable for microwave transmission, having one end fitted to the other end face of said outside conductor from outside, wherein
    - an antenna electrically connected to an inside conductor of said coaxial cable is provided at one end thereof,
    - a through-hole, extending in an axial direction from the other end face side of said outside conductor toward said axial hole, is formed in said outside conductor, said antenna extends, in a state electrically insulated from said outside conductor, into said electric discharge tube through said through-hole,
    - an outside conductor of said coaxial cable is electrically connected to said outside conductor, and
    - a gas inlet pipeline for supplying gas into said electric discharge tube is provided in said outside conductor.
2. The coaxial microwave plasma torch according to claim 1, wherein
  - a cylindrical space is formed between a peripheral face of said axial hole of said outside conductor and an outer peripheral face of said electric discharge tube, and
  - said cylindrical space extends in a radial direction by previously determined length in the inside of said outside conductor and in an axial direction from the bottom face of said axial hole by arbitrary length.

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3. A coaxial microwave plasma torch, comprising a torch body with a double-tube configuration having a cylindrical outside conductor and a cylindrical electric discharge tube arranged with a space kept in a radial direction inside said outside conductor, wherein

said outside conductor of said torch body has one end opening closed with a lid,

said electric discharge tube has one end fixed to said lid and the other end protrudingly extending from the other end opening of said outside conductor,

a coaxial cable for microwave transmission has one end fitted to said lid of said outside conductor of said torch body from outside,

an antenna electrically connected to an inside conductor of said coaxial cable is fitted to one end thereof,

said antenna extends, in a state electrically insulated from said lid, into said electric discharge tube of said torch body through a through-hole formed in said lid,

an outside conductor of said coaxial cable is electrically connected to said outside conductor, and

a gas inlet pipeline for supplying gas into said electric discharge tube of said torch body is provided in said torch body.

4. The coaxial microwave plasma torch according to claim 3, wherein  
a cylindrical auxiliary conductor is engaged into a cylindrical space formed  
between said outside conductor and said electric discharge tube in said torch body from  
the other end opening side of said outside conductor, and

said auxiliary conductor slides along the axial direction of said electric  
discharge tube without causing leakage of a microwave into a space formed with the

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inner peripheral face of said outside conductor and a space formed with the outer peripheral face of said electric discharge tube, while being in electrical contact with said outside conductor of said torch body, so as to be capable of appropriately changing a phase of a microwave.

5. The coaxial microwave plasma torch according to claim 3 or 4, wherein said gas inlet pipeline extends from the outside of said torch body into a cylindrical space between said outside conductor and said electric discharge tube through both or either of said outside conductor and said lid, and then connected to said electric discharge tube, to open to a region in the vicinity of the top of said antenna in said electric discharge tube.

6. The coaxial microwave plasma torch according to claim 3 or 4, wherein said lid of said torch body at least has an inserting section which is made of a cylindrical dielectric material and inserted into said outside conductor, said electric discharge tube has one end fixed to said inserting section, and said gas inlet pipeline includes:

a tube portion, which has an electrical insulating property and passes through said outside conductor of said torch body from the outside of said torch body;

a first tube portion, which is connected to said tube portion and passes through said inserting section of said lid; and

a second tube portion, which is connected to said first tube portion, and extends inwardly in the inside of said antenna and then extends in the axial direction toward the top of said antenna in the inside thereof, to open to said top.

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7. The coaxial microwave plasma torch according to any one of claims 1 to 6,  
wherein said antenna is made of said inside conductor of said coaxial cable.